

### Definition

Birth control plays a major role in the reproductive and overall health of both men and women. The fertility status of a couple (or an individual) can be categorized in one of four ways:

- Wish to become pregnant at present time
- Ambivalent about procreation at present time
- Desire to avoid pregnancy at present time
- Desire no further children (desire to terminate child-bearing) or desire no children at all

The desired number of children per family in the United States is now about two. Despite the availability of a number of contraceptive options, close to 50% of pregnancies in the United States are unplanned, and approximately 25% of babies born are unwanted at the time of birth.

Of particular concern is a subpopulation that is sexually mature yet not psychologically mature—adolescents. Fewer than one-fourth of the 4.5 million sexually active teenage girls use effective contraceptives consistently. Thus we are currently witnessing an epidemic of teenage pregnancies with more than 1 million teenage girls age 15 to 19 years becoming pregnant each year. One in ten U.S. teenagers age 15–19 becomes pregnant each year; this is the highest rate for any industrialized nation in the world. In the Netherlands, where the same percentage of teenage girls is sexually active, only 1 in 70 becomes pregnant. The failure in the United States to provide adequate sex education, adequate contraceptive options, and ready accessibility to contraceptives to teenagers leads to this unacceptably high rate of unintended pregnancies.

### Technique

The clinician should explore with the patient her (or his) reproductive life plan, what method of birth control is currently being used, and what medical or surgical complications might be affecting the patient's current use of a contraceptive. The patient's ability to use a particular method reliably is a crucial consideration in the selection of methods. Both the patient and the clinician may find the effectiveness rates of the various methods an important determining factor (see Table 174.1).

Assuming that the patient is a woman, the following questions will help define current fertility goals, need for birth control, use of birth control, attitudes toward birth control, and effects of birth control on menstruation, sexual activity, and general health. These questions may be provided to the patient in writing or may be asked by a physician or counselor.

- When, if ever, would you like to have a baby?
- What methods of birth control have you used?
- Have you ever been told not to use any specific method of birth control?
- Have you ever suffered any problems or experienced any complications from a birth control method?
- Describe your periods: regular or irregular, painful or not, heavy or light.
- About how often do you have intercourse?
- Are you currently using any method of birth control?
- Are you pleased with your current means of birth control?

**Table 174.1**  
First-year Failure Rates of Birth Control Methods

Method	Percentage of women who experience accidental pregnancy in the first year of use	
	Lowest expected failure rate (%) <sup>a</sup>	Failure rate in typical users (%) <sup>b</sup>
Tubal ligation	0.2	0.4
Vasectomy	0.1	0.15
Injectable progestin	0.3	0.3
Combined birth control pills	0.1	3
Progestin-only pill	0.5	3
Intrauterine device		
Copper T380A	0.8	3
Progestasert	2.0	—
Condom	2	12
Diaphragm	6	18
Sponge (with spermicide)	6–9	18–28
Cervical cap	6	18
Foams, creams, jellies, and vaginal suppositories	3	21
Coitus interruptus	4	18
Fertility awareness techniques (basal body temperature, mucus method, calendar, and "rhythm")	1–9	20
Douche	—	40
Chance (no method of birth control)	89	89

<sup>a</sup>Designed to complete the sentence: "In 100 users who start out the year using a given method and who use it correctly and consistently, the lowest observed failure rate has been \_\_\_\_\_."

<sup>b</sup>Designed to complete the sentence: "In 100 typical users who start out the year using a given method, the number of pregnancies by the end of the year will be \_\_\_\_\_." Many of the failure rates in this column were derived from Trussell J, Kost K. Contraceptive failure in the United States: A critical review of the literature. *Stud Fam Plan* 1987;18(5):Table 1. Updated to reflect subsequent studies.

- Is your partner pleased with your current means of birth control?
- Is your partner willing to cooperate in using a birth control method?
- Do you mind using a method that may interrupt love-making?
- Have you ever become pregnant when you did not plan to?
- If so, what did you do about your unplanned pregnancy?
- If you had an unplanned pregnancy in the near future, what would you consider doing?
- What are your current thoughts about sterilization?
- What are your current thoughts about abortion?
- How much can you spend on a birth control method?
- Do you receive medical or health care on a regular basis?

### Basic Science

Birth control methods are designed to prevent conception or prevent or nullify implantation. Conception can be prevented by hormonally disrupting the menstrual cycle (pills), by physically blocking the passageway (barrier methods or sterilization), or, somewhat less successfully, by abstinence during fertile periods or withdrawal. Implantation is impaired via the use of a foreign body (intrauterine device) or via surgical removal (abortion).

The average American woman starts to menstruate at about 12.5 years of age and ceases menses between the ages of 45 and 55. In her lifetime, she may ovulate 400 times, conceive 3 to 4 times, and have 2 to 3 deliveries.

A basic understanding of the menstrual cycle is fundamental to understanding how many contraceptive methods work (see Figure 174.1). A woman's fertility is tied to monthly release of an ovum, although not all cycles are ovulatory. Ovulatory cycles tend to be more regular than anovulatory cycles, are more painful than anovulatory cycles, and are associated with midcycle pain (mittelschmerz) in some women.

The average menstrual cycle is 28 days long. The first day of blood flow is considered day 1 of the cycle and marks the menstrual phase. During this menstrual phase, the endometrial lining sheds and the blood levels of estrogen and progesterone decline. Declining estrogen levels decrease the inhibition of the hypothalamus, which produces follicle-stimulating hormone releasing factor (FSH-RF) to stimulate the release of FSH and luteinizing hormone (LH) from the pituitary.

On day 5, the ovary enters the follicular phase and the uterus enters the proliferative phase. FSH stimulates the growth of several follicles in the ovary. Eventually, most of the developing follicles will atrophy while a dominant follicle matures. The LH causes the follicles to secrete estrogen, which acts to increase LH levels further but decrease FSH levels. As the estrogen levels continue to rise, the endometrium of the uterus thickens and the uterine glands enlarge. A positive feedback loop of rising LH that produces more estrogen, which in turn stimulates greater LH levels, culminates in an LH surge, a reference point in endocrinologic studies of the menstrual cycle. The surge promotes the maturation of the follicle, ovulation of the follicle, and formation of the corpus luteum from the ruptured follicle.

With the formation of the estrogen- and progesterone-

releasing corpus luteum, the ovary enters a luteal phase and the uterus enters a secretory phase. Progesterone from the ovaries stimulates endometrial glands to produce a mucus-like secretion in preparation for implantation of a fertilized egg. This phase lasts 13 to 15 days in 90% of women; thus, a menstrual cycle that is shorter or longer than 28 days generally (except for cases of luteal phase deficiency) has longer or shorter menstrual and proliferative stages.

If fertilization occurs, the egg implants on the endometrium and the trophoblast produces human chorionic gonadotropin to maintain the progesterone secretion of the corpus luteum until the placenta is mature enough, in 6 to 8 weeks, to secrete its own hormones.

If fertilization does not occur, the progesterone secreted by the corpus luteum inhibits the hypothalamic production of FSH-RF, resulting in a fall of LH secretion by the pituitary. Without trophoblast stimulation, the corpus luteum atrophies 9 to 11 days after ovulation, thus causing the estrogen and progesterone levels to fall. The thickened lining of the uterus can no longer be maintained and is sloughed off.

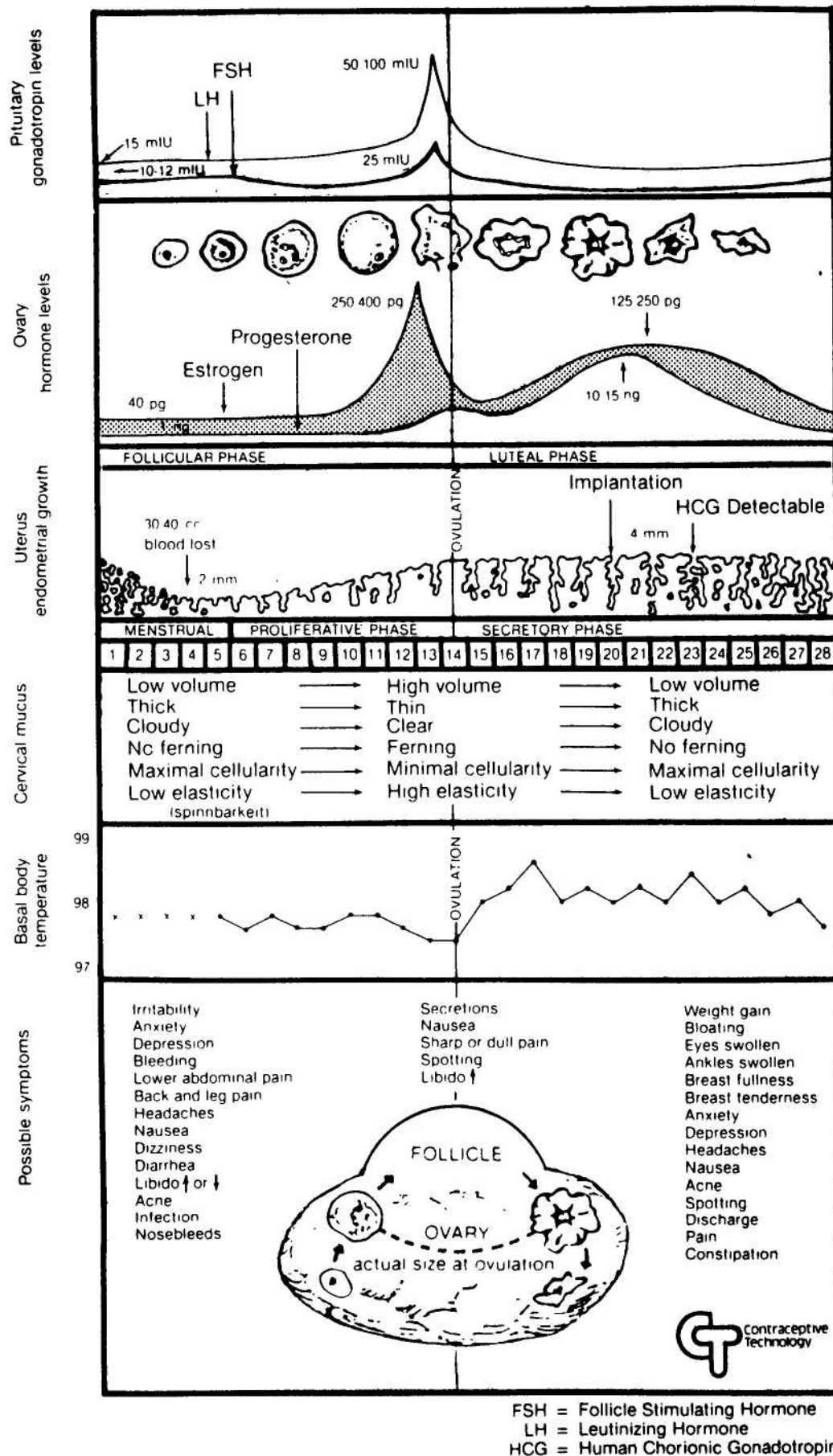
*Oral contraceptives* provide two hormones. The *estrogens* in birth control pills inhibit ovulation via the effect on the hypothalamus and the subsequent suppression of pituitary FSH and LH; inhibit implantation of the fertilized egg; accelerate ovum transport; and cause luteolysis, or degeneration of the corpus luteum, thereby causing the fall of serum progesterone levels, which prevents normal implantation and placental attachment. The *progestins* in birth control pills create a thick cervical mucus that hampers the transport of sperm; inhibit capacitation required for sperm to penetrate the cells and macromolecular investments surrounding the ovum; inhibit implantation; and inhibit ovulation by a subtle disturbance in the hypothalamic-pituitary-ovarian functions and by modification of the midcycle surge of FSH and LH.

*Intrauterine devices* are thought to: (1) create a local foreign body inflammatory response that causes lysis of the blastocyst and sperm and prevention of implantation; (2) increase local production of prostaglandins to inhibit implantation; (3) increase motility of ovum in the fallopian tube; and (4) immobilize sperm as they pass through the uterine cavity. It is now felt that the IUD prevents contraception in most women through its effects on sperm as they pass through the uterine cavity. The copper in copper-bearing IUDs may compete with zinc to inhibit carbonic anhydrase and alkaline phosphatase activity, as well as possibly interfere with estrogen uptake and effects. Progesterone-elaborating IUDs may disrupt the proliferative-secretory maturation process to impair implantation.

*Barrier methods* of contraception include condoms, diaphragms, sponges, and cervical caps that prevent the sperm from entering the uterine cavity. The spermicides used with the diaphragm and cervical cap and incorporated into the sponge kill the sperm, thus providing additional contraceptive effect should any sperm bypass the barrier.

*Fertility awareness methods* allow women to practice abstinence during days of potential fertility. Methods used to detect fertile days include basal body temperature charting, observation of cervical mucus changes, or prediction through use of the calendar. Fertility awareness methods are also used to help couples plan when to have sexual intercourse if they are trying to conceive.

*Sterilization* is an irreversible method of preventing conception. In the vasectomized male, sperm transport is obstructed via ligation of the vas deferens. In the sterilized



**Figure 174.1**

A 28-day menstrual cycle. Not all cycles are 28 days long. It is the phase before ovulation that varies in length. (Courtesy of Contraceptive Technology.)

female, ovum transport is obstructed via ligation of the fallopian tubes.

*Abortion* is unsafe after the end of the second trimester. Products of conception may be removed through the use of several methods, both surgical and medical. The surgical methods include vacuum curettage (through 13 weeks' gestation), dilation and curettage, dilation and evacuation (the most common method used during 13 through 20+ weeks of gestation), and, very rarely, hysterotomy or hysterectomy. The medical methods include prostaglandins, hypertonic saline, and hypertonic urea.

### Clinical Significance

The practicing clinician must be aware of the fertility goals and practices of patients for two basic reasons: the risks of pregnancy and the risks of contraception.

Pregnancy may adversely affect the physical or psychological health of an individual, of a relationship, or of a family unit. Women at risk of having a less than ideal outcome of pregnancy for themselves or for their child include the following: those with high parity, recent delivery (less than 12 months), recurrent premature deliveries or stillbirths, a history of postpartum depression, age less than 15 or over 40 years, chronic hypertension, sickle cell disease, advanced heart disease, and, perhaps the most important in this context, women who do not wish to be pregnant.

Efforts to avoid pregnancy (contraceptives) are used by a great number of individuals. Most clinicians need to understand the potential complications of contraceptives. Table 174.2 summarizes the relative indications, contraindications, and complications of 12 different approaches to fer-

tility control. In managing complications associated with contraceptive methods, for the most part it is best to avoid a polypharmacy approach that may include measures such as prescribing diuretics for pill-induced hypertension, pyridoxine for pill-associated depression, cafergot for pill-induced migraines, or leaving an IUD in place while giving antibiotic treatment for pelvic inflammatory disease. The remainder of this discussion focuses on some of the more serious complications and side effects of contraceptive use.

### Oral Contraceptives

The most serious side effects of pills are cardiovascular. Certain women are at greater risk of having heart attacks or strokes while on the pill. High-risk women include those who smoke; are over 35 years of age; have other health problems, such as hypertension, diabetes, heart or vascular disease; or have a family history of these problems. The excess annual death rate attributable to pill use is as follows:

Age	Smoker	Rate
35-40	No	1/6,700
	Yes	1/2,000
Under 35	No	1/77,000
	Yes	1/10,000

Patients should be carefully taught the five early danger signals shown in Figure 174.2. Patients experiencing any of these signs should be thoroughly evaluated. Less serious symptoms may be managed by observation, dosage modification, or discontinuation of the pill.

**Table 174.2**  
Twelve Methods of Fertility Control

Method of fertility control	Profile of situation pointing to consideration of method	Major or minor contraindications	Major or minor complications
Abstinence	Any individual who does not wish to be sexually active, who does not enjoy intercourse, who feels guilty about intercourse, who has an active infection of the genitourinary tract, or who finds intercourse painful	Past history of sexual activity makes it unlikely that this couple will avoid sexual intercourse in future	Frustration or guilt; couple changes plans, and woman is exposed to risk of unplanned pregnancy
Coitus interruptus (withdrawal)	No other method available; very infrequent intercourse; as a backup means of birth control to a second, more effective method	Tendency to premature ejaculation; inability to enjoy intercourse in this manner; lack of trust between man and woman	Frustration; inability for either partner to enjoy intercourse
Condoms (rubbers)	Intercourse when the development of a sexually transmitted infection, including human immunodeficiency virus, is a concern; use as a backup to another method; temporary use while treating vaginitis or STD; postvasectomy until ejaculate is free of sperm; used to treat premature ejaculation in males; teenagers	Male impotence using condom; diminished sensation; inability to use properly; lack of cooperation by male	Allergy to rubber; impotence; failure to interrupt intercourse to use method; negative associations with condoms (VD, illicit sex, one-night stands)
Diaphragm (with cream or jelly)	Woman who is not embarrassed to insert diaphragm into vagina; patient concerned about complications of other methods	<i>Major:</i> vaginal anomaly, severe cystocele or severe retroversion or anteversion of uterus; rectovaginal fistula; vesicovaginal fistula; complete	Diaphragm left in place for too long (3 to 4 weeks); allergy to rubber (rare); cystitis and/or urethritis; inability to remove the diaphragm; pelvic



Table 174.2 (continued)

Method of fertility control	Profile of situation pointing to consideration of method	Major or minor contraindications	Major or minor complications
Aerosol foam; vaginal spermicide (Delfen, Emko, Koromex, and Dalkon foams) Fertility awareness	Couple wanting safe, effective contraceptive; may have experienced complication from pills or IUD Woman desiring no birth control interventions; willing to accept possibility of pregnancy due to method failure; woman with regular cycles and clear signs and symptoms of ovulation	uterine prolapse. Pelvic or introital pain from any cause; history of repeat urinary tract infections; history of toxic shock syndrome or vaginal colonization with <i>Staph. aureus</i> <i>Minor</i> : inability to insert properly Couple unwilling to interrupt coitus or who find method aesthetically unpleasant Woman with irregular cycle or inability to understand cycle physiology; woman who requires greater contraceptive protection	cramping, discomfort, or pressure; toxic shock syndrome Vaginal or penile irritation; discharge from vagina following use; too much lubrication during intercourse Method failure; speculated concerns about overripe ovum
Foaming contraceptive suppository (Encare)	Couple frustrated with all other contraceptive options; women who find the small oval more convenient than foam to carry about; couple seeking very safe approach to contraception	Couple unwilling to interrupt coitus; fear that effectiveness rates claimed may not be corroborated	Intercourse interrupted; vaginal or penile irritation; vaginal discharge following use; suppository may fail to melt
Intrauterine devices (IUD)	Patient desiring highly effective method not related to coitus or daily use of pills; patient with history of relatively painless menses. Avoid use in patients with history of copper allergy or Wilson's disease. Inert IUDs useful following full-term delivery, in patient with history of expulsion, desire to terminate childbearing, or with difficulty returning for annual examinations. Progestasert useful for painful or heavy menses, history of expulsions	Pregnancy; endometritis or salpingitis; undiagnosed vaginal bleeding; very small uterus (less than 4.5 cm); bicornuate uterus. (Desire for future pregnancy is a relative contraindication)	Endometritis; salpingitis; sepsis; dysmenorrhea; menorrhagia, metrorrhagia, partial or complete expulsion; penile irritation; risk of miscarriage or sepsis if pregnancy occurs with IUD in place
Oral contraceptives combined	Patient desiring the most effective method of contraception (if she remembers to use method perfectly); patient embarrassed by or unwilling to use coitus-related method; patient hoping to experience one of a myriad of noncontraceptive benefits: improved dysmenorrhea, acne diminished, menstrual blood loss decreased, midcycle secretion and mittelschmerz eliminated; predictable menstrual cycles; breast enlargement; decreased likelihood of ovarian cysts. Pills with 30 to 35 µg estrogen are ideal for most pill users	<i>Absolute</i> : thromboembolic disorders or history of; cerebrovascular accident or history of; impaired liver function; malignancy of breast or reproductive system; pregnancy. <i>Strong relative</i> : headaches; hypertension; gestation of 20 weeks terminated within the past 4 weeks; prediabetes or diabetes; history of cholestasis during pregnancy; undiagnosed abnormal vaginal bleeding; sickle cell disease; heavy smoker age 35 or over; surgery planned in next month. <i>Other relative</i> : cardiac or renal disease; mental retardation; chloasma; family history of diabetes; epilepsy; depression; delivery in past 10 to 14 days or lactation; over 50 years old. (Pills may be started in women with some of the above problems and then observed to see if problem gets worse or better.)	<i>Major</i> : gallbladder disease; thromboembolic events; myocardial infarction; stroke; hypertension; migraine headaches; depression; hepatic adenoma <i>Minor</i> : nausea; weight gain; spotting; decreased menstrual flow; chloasma; decreased libido (rare); nonmigraine headaches

**Table 174.2** (continued)

Method of fertility control	Profile of situation pointing to consideration of method	Major or minor contraindications	Major or minor complications
Progestin-only pill	Patient who has suffered estrogen-related side effects from combined pills; women over 40; women with severe headaches or sickle cell disease	Similar to absolute and relative contraindications for combined pills; undiagnosed abnormal vaginal bleeding	Irregular menses; increased or decreased duration and amount of menstrual flow; spotting; amenorrhea
Sponge	Patient who has infrequent intercourse; couple that dislikes interruption associated with coital-related methods; woman not embarrassed about vaginal insertion	Allergy to polyurethane or nonoxynol-9; inability to insert or remove sponge; anatomic abnormalities interfering with proper placement or retention; history of toxic shock syndrome or vaginal colonization with <i>Staph. aureus</i>	Irritation or allergic reaction; difficulty removing sponge; vaginal dryness
Sterilization	For couple definitely wanting to terminate childbearing, sterilization is often method of choice	Most sterilization procedures should be considered irreversible; therefore, indecision about future desire for pregnancy is a strong contraindication	<i>Vasectomy</i> : hematoma; infection; pain; sperm granuloma. <i>Tubal ligation</i> : hemorrhage; tying of structure other than fallopian tube; anesthesia. Both vasectomy and tubal ligation may cause psychological problems such as concern over sexual status or ability to enjoy intercourse
Abortion	Pregnant woman who does not wish to have a baby; women who have failed to use a contraceptive or have had a contraceptive failure	The later the pregnancy, the less desirable for the patient, the medical community, and society	Hemorrhage; infections; uterine perforation; retained products of conception; anxiety and various guilt reactions

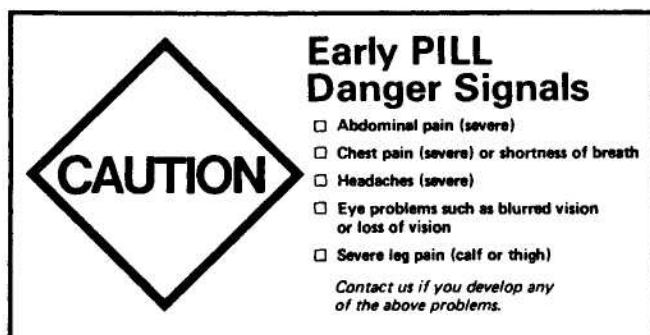
*Amenorrhea*: Rule out pregnancy, then observe or modify dosage. *Spotting*: Reassure the patient that spotting is common during the first three months of pill use. Rule out pregnancy, pelvic inflammatory disease (PID), and other gynecologic problems. Spotting may be managed by reassuring the patient, increasing the progestin dose, or increasing the estrogen dose. Initially, try to manage spotting or breakthrough bleeding by increasing the progestin in the pill provided to a woman. *Depression*: Accurately diagnose source of depression. Consider lowering the pill dose or even discontinuing the pill to see if depression improves. If serious, refer a woman for psychiatric help immediately. *Headache*: Diagnose etiology accurately. If the headache is felt to be associated with the pill, lower the dosage, switch

to a progestin-only pill, or discontinue the method. *Hypertension*: Monitor the patient's blood pressure. If the hypertension continues, discontinue the pill and consider prescribing the minipill or an alternative method. Many clinicians feel that a method of birth control other than combined oral contraceptives should be found for a woman who has a diastolic blood pressure that is consistently greater than 90 mm Hg.

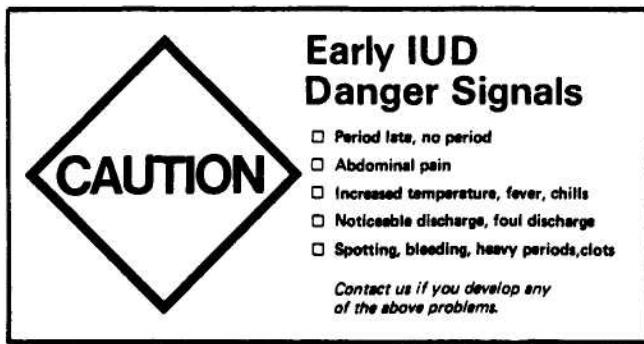
#### *Intrauterine Devices*

In IUD users, the most serious complications are perforation of the uterus and PID. IUDs have been associated with an increased risk of infertility. The Dalkon Shield presents the greatest risk of PID and should be removed in any woman who still has one in place. Because of the increased risk of pelvic infection and infertility, women desiring future pregnancies should be encouraged to use alternative birth control methods.

IUD users should be carefully taught the five danger signals in Figure 174.3. These signs must be diagnosed accurately and attended to immediately. Management of other symptoms may require removal of the IUD. *Bleeding*: For bleeding due solely to the IUD, remove the device if there is an associated endometritis, the hematocrit falls by 5 points or is 30 to 32%, the IUD is partially expelled, or the patient desires removal. *Cramping or pain*: Rule out partial IUD expulsion, pelvic inflammatory disease, spontaneous abortion, or ectopic pregnancy. Remove the IUD. After treatment or if no problem exists, another IUD may be inserted; consider a different type or size device. *Pregnancy*: Remove the IUD. Removal is associated with a 25% risk of sponta-



**Figure 174.2**  
The early danger signals associated with oral contraceptive use.



**Figure 174.3**

The early danger signals associated with use of an intrauterine device.

neous abortion. If the IUD is left in place, observe the patient carefully for spontaneous abortion (50% risk), ectopic pregnancy (5% risk), and an increased risk of septic abortion.

As of 1989, the two IUDs available in the United States are the Progestasert System, which elaborates a small amount of the hormone progesterone, and the Copper T-380A (or ParaGard), which elaborates copper. The Progestasert System must be replaced at 1 year. It is quite likely that the Copper T-380A remains effective for longer than the 4-year limit currently recommended.

### *Vaginal Contraceptives*

Vaginal contraceptives such as the diaphragm and the sponge may increase a user's risk of developing toxic shock syndrome. Users should be advised not to use the barrier methods during menses and to avoid leaving the device in place for longer than 24 hours. Symptoms of toxic shock syndrome include fever, diarrhea, vomiting, muscle aches, and a sunburn-like rash.

Other problems associated with vaginal contraceptives include allergy, urinary tract infection, discomfort, and, of course, pregnancy. An adequate fit and correct use may prevent some of the less serious problems.

### *Sterilization*

Very few serious complications are related to the sterilization procedure; most are associated with general anesthesia, if used. For vasectomized patients, most problems are managed simply by application of heat or ice or by prescription of pain medications or antibiotics. Most complications following laparoscopy, such as mesosalpingeal tears, bowel burns, or uterine trauma, require surgical repair. Minilap-

arotomy complications include wound infection, hematoma, uterine perforation, or bladder injury.

### *Abortion*

Abortion complications include incomplete abortion, lacerations or perforations, and hemorrhage. Although deaths are rare, these generally are caused by infection, pulmonary emboli, anesthesia, hemorrhage, coagulopathy, or preexisting health problems. Studies show that the earlier an abortion is performed, the safer. Moreover, dilation and evacuation is a safer procedure than saline instillation or the use of prostaglandins.

The following problems may be managed as follows. *Infection*: Remove any remaining tissue and treat with appropriate antibiotics. Hospitalize the patient if parenteral antibiotics are required or if the infection extends beyond the uterus. *Retained products of conception*: The patient generally exhibits an enlarged, tender uterus but no bleeding. Remove all remaining tissue. *Continuing pregnancy*: Rule out a bicornuate uterus, twin pregnancies, and ectopic pregnancy. *Cervical or uterine trauma*: Management ranges from simple observation to hysterectomy.

### *Noncontraceptive Benefits*

It should be remembered that while birth control methods pose a risk of adverse effects, some other effects can be beneficial. The pill offers protection from PID, ovarian and endometrial cancer, fibrocystic breast disease, fibroadenomas of the breast, and functional ovarian cysts. It alleviates menstrual pain and irregularity, as well as diminishing the amount of blood lost during menstrual flow (thus reducing the risk of anemia). The barrier methods and spermicides inhibit sexually transmitted diseases including human immunodeficiency virus (HIV). Fertility awareness methods that are used to identify fertile periods can be used as an adjunct to other birth control methods or as a means of attempting conception.

Patient education is of utmost importance in the field of family planning. The educated patient will use her method more reliably and with more satisfaction. She will also be able to identify the early signs and symptoms that may otherwise have led to serious complications.

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